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A MONITOR DEVICE OF A SWITCHER SYSTEM
(Suiccha Shisutemu no Kanshi Souchi)

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A Detailed Description.

1. Name of the invention: A monitor device of a switcher system

2. Claim

(1) A monitor device for a switcher system is characterized by containing a means for generating a diagnostic video code for each video signal; an inserter source name consists of an inserter unit (the inserter unit has a means for overlapping the video code during erasing of the vertical bright line by source name) for each video source; a switcher which selects a plural number of video signals applied to source names and sound signals based on the control signal for the program automatic emitter; a latch temporarily stores the video code of the source name applied to the video signal (output of the said switcher); and an arithmetic unit for comparing the video code of the source name with the control signal of the control signal for the said program automatic emitter.

(2) A monitor device of a switcher system is characterized by containing of a means of pulse modulation of instantaneous value in specific point of time of the sound signal; a source name inserter consists of an inserter unit (the inserter unit has a means of overlapping the pulse modulation wave during erasing of the vertical bright line as the source name) in each video source; a switcher which selects plural video signals applied to

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[1]Numbers in the margin indicate pagination in the foreign text.

source names and sound signals based on the control signal of the program automatic emitter; a pulse conversion means for converting instantaneous value of the sound output of the switcher to pulse code in the said specific point of time; a latch temporarily stores pulse modulation of the source name applied to the video signal (the output of the said switcher); and an arithmetic unit for comparing the pulse output and pulse modulation of the source name provided by the said pulse modulation means.

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3. Detailed Explanation of the Invention

This invention pertains to a monitor device of a switcher system used in a TV station.

13 A program automatic emitter (hereafter it is called APE) has
14 been widely used for automatic switching and emitting programs in
15 the TV stations. However, it is very difficult to determine whether the program source is normally output and switched according to instructions. Up to the present, this process still have to rely on human being. It is very hard to compare and determine video signals for automatic confirmation by an automatic device directly under the current situation.

This invention provide a device that automatically monitors operation of the switcher system by monitoring video signals after a switcher is passed. The program source code is applied to a portion of the video signals, and sample value of the sound signal is also coded and applied.

Constitution of this invention is explained by working examples with reference of diagrams in the following. Fig. 1 is a connection diagram of the main structural elements of this invention. In this diagram, V_1, V_2, ...V_N are independent number of "N" video source input terminals (hereafter video signal itself is also called $V_1 \ldots V_N$). A_1, $A_2 \ldots A_N$ are independent number of "N" audio source input terminals (hereafter, audio signal itself is also called $A_1 \ldots A_N$). Video signals V_{N-1} and V_N obtained from inside the TV Station are provided to the source name inserter "1" as they are, since frame synchronization is performed to video signals V_{N-1}, V_N. The video signals V_1 and V_2 sent from outside of the TB Station are provided to the source name inserter "1" via the frame synchronizer "2" and "8" for frame synchronization. The input terminals $A_1 \sim A_N$ of the audio signal are connected to the switcher "4", as well as connected to the source name inserter "1". The source inserter "1" applies the sample value of the code and audio signal according to the program source in specific part of the vertical bright line erasing period of the video signal. Number of "N" output is provided to the switcher "4". The program automatic emitter (APE) "5" controls the switcher "4" by selecting the basic system program and stand-by system from number of "N" program source (consists of video signals and usually audio signals). The output is provided to the switcher "4" and automatic monitor "6". As shown in the outline of Fig. 1, the switcher "4" is based on the control signal applied from the APE "5" and provided to the

stabilization amplifier SA_1 and SA_2 by selecting two video signals of the basic system and stand-by system from video signals $V_1 \sim V_N$. Only the amplification output of the basic system program is output as the video output signal. Further, two audio signals of the basic and stand-by systems are selected from the audio signals $A_1 \sim A_N$. Only the audio signal of the basic system is output as the audio output signal. The video output signal of the switcher is provided to the self-excitation monitor "6" and applied to the VITS "7" (VIDEO INTERVAL TEST SIGNAL ELIMINATOR). Also, "L" and "R" audio output signals of the switcher "4" are applied to the self-excitation monitor "6" and output terminals "8L" and "8R". The self-excitation monitor "6" monitors switch control operation in the switcher "4" based on audio output signals of the switcher "4" and switcher control signal provided from APE "5". An alarm "10" and printer "11" are connected to the output terminal of the automatic monitor "6". In case of abnormality is occurred in the switch control, send an alarm and output printing. Also, output of the self-excitation monitor "6" is provided to the switcher "4". The switcher "4" switches from the said basic system program to the stand-by system program in case of abnormality. The VITS eliminator "7" eliminates the source name applied to the video signal and modifies to the original normal video signal. The output is provided to the output terminal "9".

Next, structure of the source name inserter "1" and automatic monitor "6" is explained by referring to Figs. 2 and 8.

Fig. 2 is a block diagram showing one inserter unit of the source name inserter "1". In this diagram, "20L" and "20R" are "L" and "R" audio input terminals of the program "P" and are connected to the input terminals of the amplifiers "21" and "22". The amplifiers "21" and "22" amplify "L" and "R" audio signals to desired level. The output is provided to the rectification integrating circuits /345 "28" and "24". The rectification integrating circuits "28" and "24" rectify the audio signal and integrate by specific time constant. The output is provided to the monostable multivibrators "25" and "26". A synchronizing signal input terminal "27" is connected to the trigger circuit "28" for "L" and trigger circuit "29" for "R". The trigger circuits "28" and "29" for "L" and "R" generate trigger pulse successively interval of specific short period of time, within one level scanning section (for example 15H) in the vertical bright line erasing period, based on the synchronizing signal. The output is provided to the monostable multivibrators "25" and "26", respectively. When trigger pulse is provided from the "L" and "R" trigger circuits "28" and "29" to the monostable multivibrators "25" and "26", pulse is generated with length according to the size of output direct current of the rectification integrating circuits "28" and "24". The output is provided to the differentiating circuits "80" and "81" in the next stage, respectively. The differentiating circuits "80" and "81" differentiate input pulse down, and sharp pulse is obtained

when the pulse is down. Thus, the size of the audio signal is PPM modulated by this operation. The output is provided to the mixed circuit "32". Next, "88" is a video code switch consists of a group of eight switches. The video code switch "88 determines bit numbers (eight bits video code in this case) according to the switch number by on/off operation. Each video signal $V_1 \sim V_N$ has an inherent video code used for the purpose of discrimination. Also, among 8 bits video code, for example, 4 bits is regarded as "1" level, confirmation of the super output (it will be explained later) and error code becomes easy. The video code switch "88" is connected and input to the shift register "84". A much shorter period than the one-plane scanning period (for example, 2.2 μS clock pulse) is provided to the clock pulse input terminal "84 CP" of the shift register "84". The output is applied to the mixed circuit "82". In the mixed circuit "82", gate pulse equivalent to 15H of the vertical bright line erasing period is provided from the terminal "32a". In this period, the output of the differentiating circuits "80" and "81" and the shift register "84" are mixed, and the output is provided to the output circuit "35". The input terminal "36" of the video source is connected to the output circuit "35". The output circuit "35" applies the source name which consists of the video code and audio PPM signal provided via the input terminal "86". The output is sent to the switcher "4" via the output terminal "87". Needless to say that the inserter unit requires the same number with the program number.

Fig. 3 is a block diagram showing a working example of the automatic monitor "6". In this diagram, "40" is an input terminal of the video signal selected from the switcher "4" and connected to the slicer "41". The level slicer "41" fetches out the pulse train applied by the source name inserter "1" and transfers to the next stage by slicing the video signal by the specific level. Output of the level slicer "41" is provided to the L channel audio latch "48" and R channel audio latch "44". The source code latch "42" only selects and temporarily stores the video source code among the pulse train. The data are provided to the arithmetic unit "46" via the input inserter phase. L and R channels of audio latches "43" and "44" temporarily store PPM signals of the L and R channels of audio by converting voltage. The output is provided to PCM converters "47" and "48". PCM converters "47" and "48" convert PPM signal to PCM signal. Their output is provided to the arithmetic unit "46" via the input interface "45". L and R audio signals selected by the switcher "4" are provided to the amplifiers "51" and "52" via the audio input terminals "49" and "50" for L and R. The amplifiers "51" and "52" amplify the audio signal to desired level. Their output is provided to the rectification integrating circuits "53" and "54" having the same time constant with the rectification integrating circuits "28" and "24" of the source name inserter "1". The output is provided to the sample holder circuits "55" and "56". The trigger circuits

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"57" and "58" for L and R connected to the sample holder circuits "55" and "56" are as same as trigger circuits "28" and "29" for L and R of the source name inserter "1", and they generate trigger signals based on the synchronizing signal provided to the terminal "59". The sample holder circuits "55" and "56" sample and maintain direct current level applied from the rectification integrating circuits "53" and "54" at the time point when the trigger signal is provided. The output is provided to the AD converters "60" and "61" in the next stage. The AD converters "60" and "61" convert the held current to digital value, and the output is provided to the arithmetic unit "46" via the input terminal "62" and input interface "45" of the automatic monitor "6". The arithmetic unit "46" compares and collates the video selected control information provided from the APE "5" with the source code applied to the video signal actually selected by the switcher "4". Also, the audio sample value data applied to the video signal is compared with the sample value obtained from the audio AD converters "60" and "61" actually selected by the switcher "4". Take an example of the audio signal, if sample value difference of the two is within 6dB, it is determined as identical. If data applied to the video signal is as same as the video and audio signal actually selected by the switcher "4", the arithmetic unit "46" provides output to the output interface "68". Since the output interface "68" provides signal of the arithmetic unit "46" to the outside circuit, the output is provided to the alarm "10", printer "11", and switcher "4". By

connecting the output interface "68" with the switcher "4", it can be immediately switched from the basic system to the preliminary system in case of abnormality.

Next, operation of the working example is explained with reference of Fig. 4. Video signals $V_1 \sim V_N$ are sent to the source name inserter "1" directly or via the frame synchronizers "2" and "3". Also, audio signals $A_1 \sim A_N$ are sent to the source name inserter "1". In each inserter unit of the source name inserter "1", the trigger circuits "28" and "29" for L and R generate trigger signals in 15H of vertical bright line erasing time VBL as shown in Fig. 4 (a). The audio signals for L and R convert into pulsating flow by the rectification integrating circuits "28" and "24". As shown in Fig. 4 (b) by T_1 and T_2, pulse with width proportionate to direct current level at trigger pulse generation time point is generated by the monostable multivibrators "25" and "26". Since pulse down is differentiated by the differential circuits "80" and "81", sharp pulse can be obtained in the position of T_1 and T_2 corresponding to the direct current level by taking the trigger pulse generation time point as the standard. PPM modulation is performed. Also, if the video code switch "88" is set to "01110010", serial signal is provided to the mixed circuit "32" from the shift register "84". The mixed circuit "82" performs analog calculation of those signals. As shown in Fig. 4 (b), the source name is applied in 15H period of the video signal by the output circuit "85". Each video signal applied with source name is provided to the switcher

"4", video of the basic system and preliminary system is selected by the control signal from APE "5". Same as the audio signals provided to the terminals $A_1 \sim A_N$, audio signals of the basic system and preliminary system are also selected by the control signal provided from APE "5". Video signal and audio signal of the basic system output from the switcher "4" are provided to the automatic monitor "6". The source name applied to the video signal separates from the video signal by the level slicer "41" of the automatic monitor "6". PPM signal of the L channel and R channel and source code are provided to the arithmetic unit "46" via the latched input interface "45". Also, audio signal is rectified and integrated by the rectification integrating circuits "53" and "54", similar to the rectification integrating circuit and trigger circuit of each inserter unit, and it is sampled by the sampling circuits "55" and "56". The sampling value is applied to the arithmetic unit "46" via the input interface converted to digital value by the AD converter "60" and "61". The arithmetic unit "46" compares the APE data with the source code contained within the video signal and the sample value obtained from the audio signal with PPM signal of the video signal. If they are not match with each other, the arithmetic unit "46" operates the alarm "10" via the output interface "68", emits an alarm, and prints out the accident content by the printer "11". Furthermore, it automatically switches from the basic system to the preliminary system by the switcher "4".

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As explained in details above, with this invention, since the source name is applied to each field, not only switcher control and imperfect contact can be constantly monitored, but also broad level change of the image distribution amplifier installed in each location and the stabilization amplifier SA can be detected. Also, when the super device showing caption on the image is installed in the post-deflection of the stabilization amplifier SA, the video source code of the video signal is logically calculated. Super output can be determined if the overlapping source code is confirmed. Regarding to pair? source of the audio and image, switcher operation of the audio source can also be monitored. In case of bilingual broadcasting, monitor of scanty foreign audio also becomes reliable. In case of abnormality, it is switched to the preliminary system immediately by a field unit, and print-out is possible. Moreover, switch operation can be confirmed in a short period of time by controlling so that the switcher is searched in APE immediately before broadcasting.

With this working example, in the source name inserter, PPM modulation is used for pulse modulation of the audio signal, however, other modulation methods such as PCM modulation can also be used. In this working example, audio signal is sampled after rectification integrating. Of course, audio can be directly sampled.

4. Brief explanations of the diagrams.

Fig. 1 is a main connection diagram of a monitor device of

the switcher system shown in the working example of this invention. Fig. 2 is a block diagram showing one inserter unit of the source name inserter. Fig. 3 is a block diagram of the automatic monitor. Fig. 4 is a wave shape diagram for explaining operation of the working example.

1...source name inserter, 4...switcher, 5...APE, 6...automatic monitor, 10...alarm, 11...printer, 28, 24, 58, 54...rectification integrating circuits, 25, 26...monostable multivibrator, 46...arithmetic unit.

Fig. 2

23 and 24...rectification integrating circuit, 25 and 26...monostable multivibrator, 28...trigger circuit for L, 29...trigger circuit for R, 30 and 31...differentiating circuit, 32...mixed circuit, 34...shift register, 35 and 36...output circuit.

Fig. 3

4...switcher, 10...alarm, 11...printer, 40...video signal, 41...level slicer, 42...source code latch, 43...LCH audio latch, 44...R-CH audio latch, 45...input interface, 46...arithmetic unit, 47...PCM conversion for L, 48...PCM conversion for R, 49...audio signal L, 50...audio signal R, 51 and 52...AMP, 53 and 54...rectification integrating circuit, 55 and 56...SH, 57...trigger circuit for R, 58...trigger circuit for L, 60 and 61...AD conversion.

エース 68 を介してアラーム 10 を作動させて警報を発しプリンタ 11 により事故内容をプリントアウトし、さらにはスイッチャー 4 により自動的に基本系統から予備系統に切換えられる。

以上詳細に説明したように本発明によれば、各フィールドにソースネームが付加されているので、常にスイッチャーの制御、接続不良を監視できるだけでなく、安定化増幅器 SA や各所に配置される映像分配増幅器の大幅なレベル変化をも検出することができる。また、画像上に字幕をのせるスーパー装置を、たとえば安定化増幅器 SA の後段に設けた場合には、ビデオ信号のビデオソースコードは順次加算されるので、重畳されたソースコードを確認すればスーパー出力を判定することができる。音声と映像のペアソースについては音声ソースのスイッチャー操作も同様に監視することができ、二カ国語放送の場合とかく手間になりがちだつた外国語音声のモニタも確実となる。また、異常があつた場合にフィールド単位で瞬時に予備系統に切換え、プリントアウトすることができる。さらに放送開始前に APE にスイッチャーをサーチするよう制御させればスイッチャーの動作を短時間で確認することができる。

なお、本実施例ではソースネームインサータにおいては音声信号のパルス変調には PPM 変調を用いているが、PCM 変調等他の変調方式を用いてもよいことはいうまでもなく、また本実施例では音声信号を整流積分した後でサンプリングしているが音声そのものを直接サンプリングする方法も当然可能である。

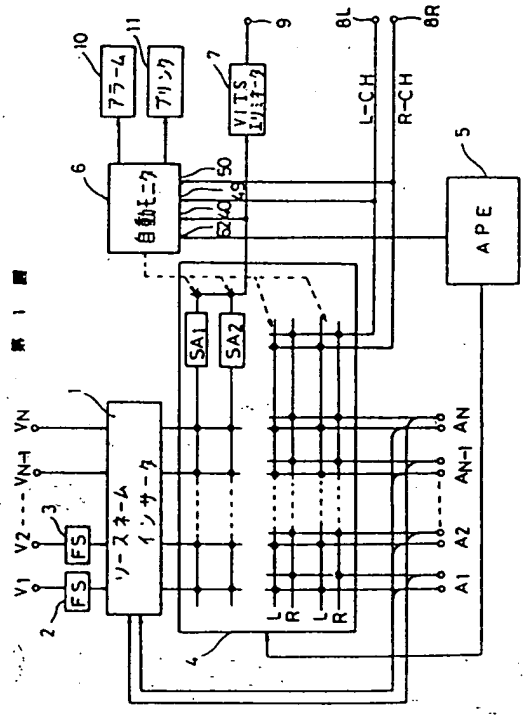
4. 図面の簡単な説明

第 1 図は、本発明の一実施例を示すスイッチャーシステムの監視装置の主要部接続図、第 2 図はソースネームインサータの一つのインサータユニットを示すブロック図、第 3 図は自動モニタのブロック図、第 4 図は本実施例の動作を説明するための波形図である。

1 …ソースネームインサータ　4 …スイッチャー
5 … APE　6 …自動モニタ　10 … アラーム
11 …プリンタ　28,24,58,54 …整流積分回路

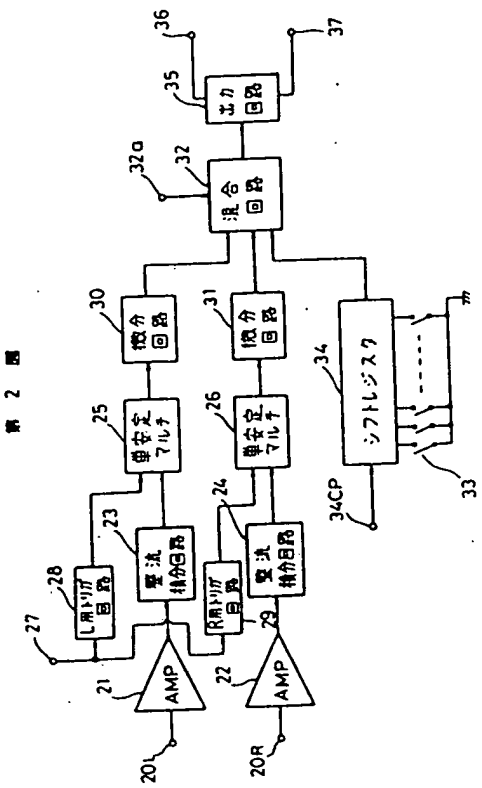
25,26 …単安定マルチバイブレータ　46 …演算装置

代理人弁理士　東　島　隆　治　ほか 1 名



第 1 図

第2図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混合回路
微分回路
単安定マルチ
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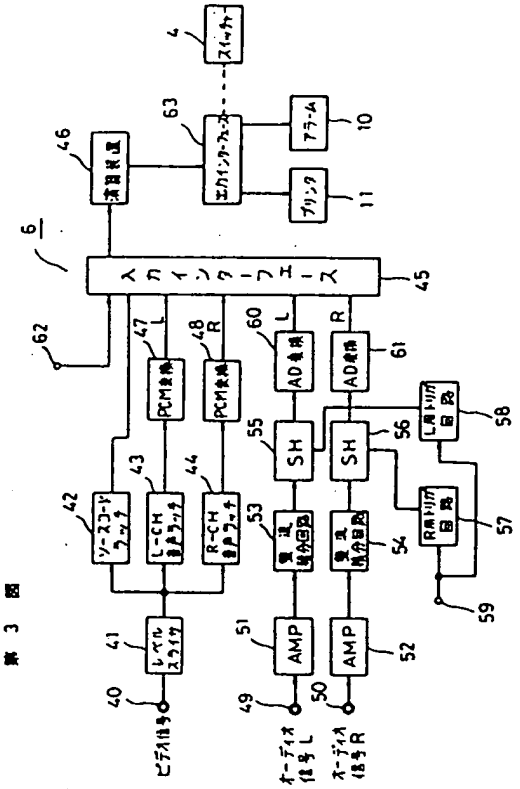
R再トリガ回路
整流積分回路
AMP

第3図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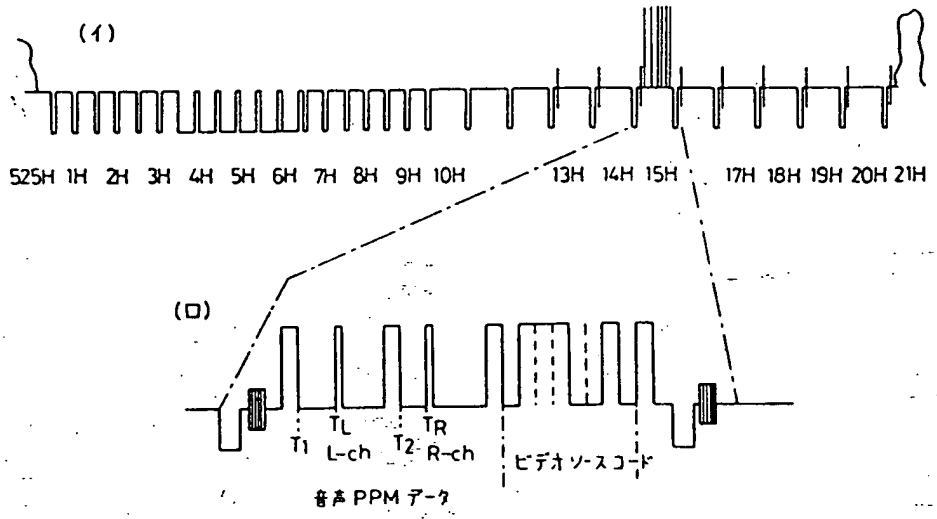
第4図


(イ)
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(ロ)
T1
TL
L-ch
T2
TR
R-ch
ビデオソースコード
音声PPMデータ